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## RNA Isolation and Purification

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Transfection

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and Purification

DNA Isolation  
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and Plants

DNA and RNA  
Isolation from  
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Isolation

Phage DNA  
Isolation

DNA Cleanup, Gel  
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## RNeasy® Total RNA System

The RNeasy® Total RNA isolation system is designed for fast and efficient isolation of from a wide variety of samples. Different kits are tailored to suit different RNA purification. RNeasy sample preparation technology is fully licensed, allowing RNeasy purified nucleic acids to be used in any molecular assay or other downstream application without risk of patent infringement.

### Features and benefits

- High-quality total RNA in minutes
- No phenol/chloroform extraction, no CsCl gradients, no LiCl or ethanol precipitation
- Excellent recovery of RNA from very small to large amounts of starting material
- Ready-to-use RNA for any downstream application

### RNeasy Kit Options

#### Sample Source

#### Recommended RNeasy Kit

#### Animal cells

Small-to large-scale

RNeasy Mini, Midi, and Maxi Kits

96-well format

RNeasy 96 Kit

Automated, 96-well format

RNeasy 96 BioRobot Kit

#### Animal tissues

Small- to large-scale

RNeasy Mini, Midi, and Maxi Kits

#### Bacteria or yeast

Small-to large-scale

RNeasy Mini, Midi, and Maxi Kits

#### Whole blood

see QIAamp® RNA Blood Mini Kit

#### Plant cells or tissues

RNeasy Plant Mini Kit

#### Filamentous fungi

RNeasy Plant Mini Kit

#### In vitro transcripts and enzymatic reactions

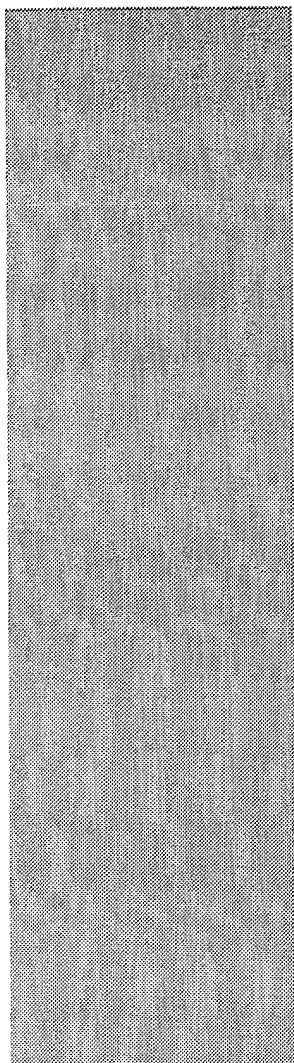
Small-to large-scale

RNeasy Mini, Midi, and Maxi Kits

96-well format

RNeasy 96 Kit

Additional RNeasy Buffers



## Principle ·

RNeasy Kits simplify total RNA isolation by combining the stringency of guanidine–isothiocyanate lysis with the speed of silica–gel–membrane purification. RNeasy technology replaces cumbersome and problematic RNA isolation procedures such as phenol/chloroform extraction\*, centrifugation through CsCl cushions, and precipitation with LiCl or alcohol. RNeasy purification also provides an enrichment for mRNA since most RNAs <200 nucleotides (which comprise 15–20% of total RNA) are selectively excluded.

## Procedure ·

Samples are first lysed and then homogenized. Ethanol is added to the lysate to provide ideal binding conditions (see flowchart). The lysate is then loaded onto the RNeasy spin column. RNA binds, and all contaminants are efficiently washed away. Pure, concentrated RNA is eluted in water.

## Applications ·

RNA purified with RNeasy technology has  $A_{260}/A_{280}$  ratios of 1.9–2.1<sup>†</sup> and is ideal for use in all applications. (See [RNeasy references](#).)  
Downstream applications include:

- Northern, dot, and slot blotting
- RT-PCR
- Poly A<sup>+</sup> RNA selection



**Other sections of interest****References for total RNA isolation and cleanup with the RNeasy System****Related Products**[Total RNA isolation from whole blood with the QIAamp RNA Blood Mini Kit](#)[Viral RNA isolation from cell-free body fluids with the QIAamp Viral RNA Mini Kit](#)[Poly A<sup>+</sup> mRNA isolation with the Oligotex™ System](#)[Parallel isolation of RNA and genomic DNA and isolation of low-molecular-weight R](#)[the QIAGEN® RNA/DNA System](#)[QIAGEN Reverse Transcriptases](#)**Accessories**[Homogenization of cell and tissue lysates with QIAshredder™ homogenizers](#)[DNase digestion during RNA purification with the RNase-Free DNase Set](#)[Plasticware and tape sheets](#)**Technical information**[Spectrophotometric quantitation of nucleic acids](#)[Sizes and molecular weights of various RNAs](#)[RNA content and distribution in various cells and tissues](#)**QIAGEN purification technologies****QIAGEN literature**[Brochure: High-Performance RNA](#)**The QIAGEN RNA Club**

\* RNA prepared using phenol-extraction methods may contain contaminating phenol, which affects the A<sub>260</sub> of the purified RNA due to absorbance of phenol at 270 and 275 nm (see Stulnig, T.M. and Amberger, A. (1994) contaminating phenol in nucleic acid preparations. *BioTechniques*, **16**, 403).

† Measured in 10 mM Tris-Cl, pH 7.5. See "[Spectrophotometric Quantitation of Nucleic Acids.](#)"

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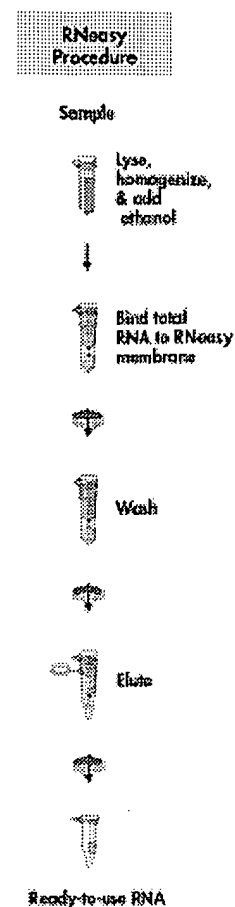
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### References for Total RNA Isolation and Cleanup with the RNeasy System

This is a partial list of papers citing RNeasy Kits for total RNA isolation and cleanup. Please contact [QIAGEN Technical Services](#) or your local distributor for a complete references.

#### Selected RNeasy References

Dechant, G., Tsoulfas, P., Perada, L.F., and Barde, Y.A. (1997) The neurotrophin receptor p75 binds neurotrophin-3 on sympathetic neurons with high affinity and specificity. *J. Neurosci.* **17**, 5281.

► Total RNA from **chicken ganglia and neuronal cell cultures** for RT-PCR

Dudareva, N., Cseka, L., Blanc, V.M., and Pichersky, E. (1996) Evolution of floral sc *Clarkia*: novel patterns of S-linalool synthase gene expression in the *C. breweri* flow. *Plant Cell* **8**, 1137.

► Total RNA from **Clarkia flower parts** to localize gene expression

Estacio, W., Santa Anna-Arriola, S., Adedipe, M., and Márquez-Magaña, L.M. (1998) Dual promoters are responsible for transcription initiation of the *flaA* operon in *Ba subtilis*. *J. Bacteriol.* **180**, 3548.

► Total RNA from **Bacillus subtilis** for primer-extension analysis

Gonzalez, P., Zigler, J.S., Jr., Epstein, D.L., and Borrás, T. (1999) Identification and isolation of differentially expressed genes from very small tissue samples. *BioTechniques* **26**, 884.

► Total RNA from small amounts of **human eye tissue** for expression-array analysis

Hassink, S.G. et al. (1997) Placental leptin: an important new growth factor in intrauterine and neonatal development? *Pediatrics* **100**(1), e1.

► Total RNA from **human placenta and fat biopsy samples** for multiplex RT-PCR

Hoecker, U., Tepperman, J.M., and Quail, P.H. (1999) SPA1, a WD-repeat protein specific to phytochrome A signal transduction. *Science* **284**, 496.

► Total RNA from **arabidopsis** to study gene expression of a phytochrome suppressor

Lepik, D., Ihes, I., Kristjuhan, A., Maimets, T., and Ustav, T. (1998) p53 is a suppressor of papillomavirus DNA amplificational replication. *J. Virol.* **68**82.

► Total RNA from **transfected CHO cells** for northern-blot analysis

Lewin, A.S. et al. (1998) Ribozyme rescue of photoreceptor cells in a transgenic rat model of autosomal dominant retinitis pigmentosa. *Nature Med.* 4, 967.

► Total RNA from **rat retinae** for RT-PCR

McKenzie, D.J., McLean, M.A., Mukerji, S., and Green, M. (1997) Improve RNA extraction from woody plants for the detection of viral pathogens by reverse transcription – polymerase chain reaction. *Plant Disease* 81, 222.

► Viral RNA from **woody plants** for RT-PCR

Meller, V.H., Wu, K.H., Roman, G., Kuroda, M.I., and Davis, R.L. (1997) rRNA paints the X chromosome of male drosophila and is regulated by the dosage compensation system. *Cell* 88, 445.

► Total RNA from **drosophila** for developmental gene-expression analysis

Motlik, J., Carnwath, J.W., Herrmann, D., Terletski, V., Anger, M., and Niemann, H. (1998) Automated recording of RNA differential display patterns from pig granulosa cells. *BioTechniques* 24, 148.

► Total RNA from **pig granulosa cells** for differential-display RT-PCR

Nakayama, J.-i., Tahara, H., Tahara, E., Saito, M., Ito, K., Nakamura, H., Nakanishi, T., Tahara, E., Ide, T., and Ishikawa, F. (1998) Telomerase activation by hTERT in human normal fibroblasts and hepatocellular carcinoma. *Nature Genet.* 18, 65.

► Total RNA from **human liver carcinoma biopsy samples** for RT-PCR

Nichols, B.L., et al. (1997) Effects of malnutrition on expression and activity of lactase in children. *Gastroenterology* 112, 742.

► Total RNA from small amounts of **embedded tissue** after several years of storage

Outinen, P.A., et al. (1998) Characterization of the stress-inducing effects of homocysteine. *Biochem. J.* 332, 213.

► RNeasy total RNA and Oligotex mRNA for **expression-array and differential-display analysis**

Popik, W., Hesselgesser, J.E., and Pitha, P.M. (1998) Binding of human immunodeficiency virus type 1 to CD4 and CXCR4 receptors differentially regulates expression of inflammatory genes and activates the MEK/ERK signaling pathway. *J. Virol.* 72, 6406.

► Total RNA from **Jurkat T cells** for RT-PCR

Randhawa, J.S., Marriott, A.C., Pringle, C.R., and Easton, A.J. (1997) Rescuing of synthetic minireplicons establishes the absence of the NS1 and NS2 gene from avian pneumovirus. *J. Virol.* 71, 9849.

► RNA cleanup of **in vitro transcripts** for transfection of mammalian cells

Rieder, G., Hatz, R.A., Moran, A.P., Walz, A., Stolte, M., and Enders, G. (1998) Role of adherence in interleukin-8 induction in Helicobacter pylori-associated

*gastritis. Infect. Immun.* **65**, 3622.

► Total RNA from **human gastric biopsy samples** for competitive RT-PCR

*Su, S., Vivier, R.G., et al. (1997) High-throughput RT-PCR analysis of mul transcripts using a microplate RNA isolation procedure. BioTechniques 22, 1107.*

► **High-throughput RNA isolation** with the RNeasy 96 Kit for transcription-pattern analysis

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